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Additional Chromosome Numbers—New Zealand Ferns

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Abstract

HAPLOID chromosome numbers are given for 30 species and one variety of New Zealand ferns. In addition a case of polyploidy is recorded within a single species.

The present paper continues the record of chromosome counts in New Zealand ferns, bringing the number now examined to approximately three-quarters of the total fern flora. It is hoped that eventually all species may be counted, but it will probably be some time before all the rare ferns can be located and sampled.

LIST OF SPECIES AND CHROMOSOME NUMBERS

Species	Locality	Chromosome number
Botrychium australe R.Br. var. *millefolium* Prantl	Tarata, Taranaki	n = 45
Marattia salicina Smith	Christchurch Gardens	n = 39
Todea barbara (L.) Moore	Christchurch Gardens	n = 22
Schizaea dichotoma (L.) Smith	Oratia, Auckland	n = c.540
Lygodium articulatum A. Rich.	Henderson	n = c.70
Gleichenia microphylla (R.Br.) C.Chr.	Kumara	n = 20
Sticherus flabellatus (R.Br.) St. John	Helena Bay, Northland	n = 34
Mecodium pulcherrimum (Col.) Copel.	Otira	n = 36
Mecodium sanguinolentum (Forst.) Pr.	Ross	n = 36
Mecodium sanguinolentum (Forst.) Pr.	Lyttelton Port Hills	n = 72
Mecodium flexuosum (A. Cunn.) Copel.	Ross	n = 36
Dicksonia lanata Col.	Waikaremoana	n = 65
Lindsaea viridis Col.	New Plymouth	n = c.88
Hypolepis punctata (Thbg.) Mett.	Kare Kare, Auckland	n = 104
Leptolepia novae-zealandiae (Col.) Kuhn	Kaituna	n = c.47
Histiopteris incisa (Thbg.) J. Smith	Paroa, Westland	n = c.96
Pteris macilenta A. Rich	Nelson	n = 60
Pteris comans Forst. f.	Kare Kare, Auckland	n = 30
Adiantum affine Willd.	Ashley Gorge	n = 58
Adiantum diaphanum Bl.	Christchurch Gardens	n = 116

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Species	Locality	Chromosome number
Adiantum formosum R.Br.	Massey College	n = 58
Pellaea falcata (R.Br.) Fee	Nelson	n = 58
Cyathea medullaris Sw.	Queen Charlotte Sd.	n = 69
Davallia tasmani Cheesem.	Otari, Wellington	n = 40
Ctenitis decomposita (R.Br.) Copel	New Plymouth	n = 82
Cyclosorus gongylodes (Schkr.) Link.	Taupo	n = 36
Cyclosorus nymphalis (Forst.) Ching)	Taupo	n = 72
Athyrium japonicum (Thbg.) Copel.	Northland	n = 82
Doodia media R.Br.	Waiwera Hill, Auckland	n = 64
Doodia caudata R.Br.	Waiwera Hill, Auckland	n = c.96
Asplenium lamprophyllum Carse	New Plymouth	n = 72
Grammitis ciliata Col.	Cass	n = 37
Pyrrosia serpens (Forst. f.) Ching	Paroa, Westland	n = 37

NOTES ON THE FAMILIES

Ophioglossaceae

Because of the difference in leaf form and the localized distribution the variety of *Botrychium australe* was examined. The content n = 45 (Plate 1, fig. 1) is, however, the same as that found in the typical form.

Marattiaceae

The finding of n = 39 (Plate 1, fig. 2) for *Marattia salicina* is quite in accord with the only other published figure, that of n = 78 by Ninan (1956). Two base numbers 39, 40 (Manton and Sledge, 1954) thus exist in this family, one being probably derived from the other.

Schizaeaceae

The extremely large number of n = c.540 for *Schizaea dichotoma* is obviously of little help in elucidating the situation in the genus, but as the species appears to be a complex in the South Pacific, lower degrees of polyploidy may be found. In *Lygodium* Manton and Sledge (1954) have found several tropical species to be based on n = 29, 30, but the local species with n = c.70 does not show a clear relationship with these. In this family we probably have a few isolated remnants of a once diverse fern flora, a situation which appears to be parelleled in the Gleicheniaceae.

Gleicheniaceae

The two species listed are similar in chromosome content to other records for this group (Brownlie, 1958), and they are illustrated in Plate 1, figs. 3 and 4.

Hymenophyllaceae

In the above list I have recorded the first known occurrence of polyploidy in a single species of this family. The figure n = 72 for *Mecodium sanguinolentum* was previously reported (Brownlie, 1954), and since then other material with n = 36 (Plate 2, fig. 1) has been examined. There appears to be no obvious morphological difference except that the Lyttelton Port Hills material is smaller, a character reflecting its more exposed and drier habitat. The spores also are similar in size in both forms.

Pteridaceae

The new records for species of *Dicksonia, Hypolepis, Pteris, Adiantum* and *Pellaea* are in accord with previously published figures for these genera, and this report also

FIG. 1.—*Botrychium australe* var. *millefolium* × 1200 n = 45

FIG. 2.—*Marattia salicina* × 1200 n = 39

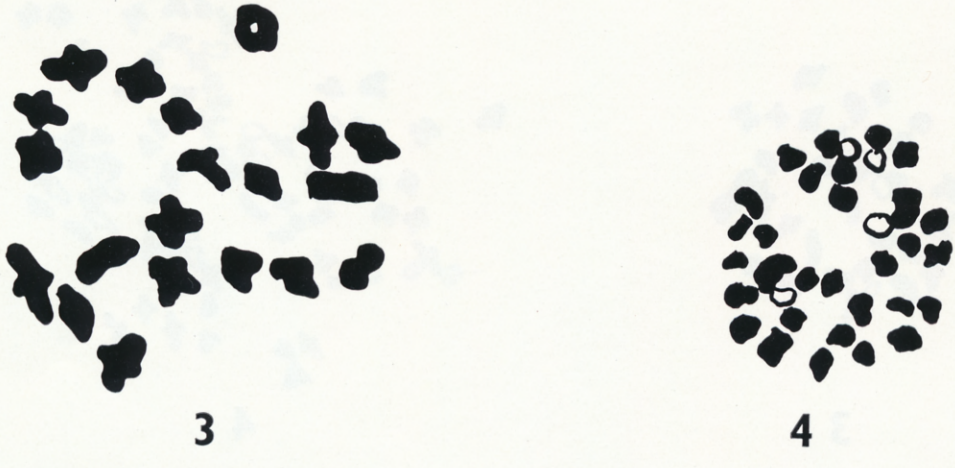

FIG. 3.—*Gleichenia microphylla* × 1200 n = 20

FIG. 4.—*Sticherus flabellatus* × 1200 n = 34

FIG. 1.—*Mecodium sanguinolentum* × 1200 n = 36

FIG. 2.—*Leptolepia novae-zealandiae* × 1200 n = c.47

FIG. 3.—*Cyclosorus gongylodes* × 1200 n = 36

FIG. 4.—*Athyrium japonicum* × 1200 n = 82

The two cross-hatched objects represent extraneous material.

corrects an error in an earlier paper (Brownlie, 1954) for *Histiopteris incisa*. *Leptolepia* with n = c.47 (Plate 2, fig. 2) belongs with the rather assorted genera of Copeland's Pteridaceae which appear to be cytologically diverse from one another. The present state of knowledge of this group has been summarised by Manton (1958). It is possible that we have here a group of ferns intermediate in age between the ancient families such as the Gleicheniaceae and Schizaeaceae and the modern forms such as the Aspleniaceae. *Lindsaea viridis* is another species which belongs to this section, but the approximate figure of n = 88 has not previously been recorded for the genus.

Davalliaceae

The single New Zealand species of the genus *Davallia* is restricted naturally to the Three Kings Islands, but material was kindly supplied by Mr. W. B. Brockie of the Otari Gardens, Wellington. Cytologically it is similar to species reported from Ceylon by Manton and Sledge (1954) and from Malaya by Manton (1954).

Aspidiaceae

Athyrium japonicum (Plate 2, fig. 4) with n = 82 is in accord with the other New Zealand species *A. australe* (Brownlie, 1958), and is consequently based on 41, a figure noted as consistent for *Diplazium* by Manton and Sledge. The other species of this group reported, one of *Ctenitis* and two of *Cyclosorus* (Plate 2, fig. 3) are all in line with earlier numbers reported.

Blechnaceae

Specimens of *Doodia caudata* with n = c.96 contrast with the reported n = c.64–5 for Australian material (Manton and Sledge, 1954). *D. media* material from the same locality had n = 64, but in both cases there is the suspected presence of additional univalents. A further pair of plants from the same area which morphologically appear to be intermediates between these two species, although closer to *D. media* were found to have 60+ bivalents and 30+ univalents. A detailed study of the populations of this area is therefore required.

The remaining species listed—one each of *Todea, Cyathea, Grammitis* and *Pyrrosia*—are not in any way unusual.

With the publication of the above figures the bulk of the New Zealand fern flora has been examined cytologically, there being about only 26 spp. outside the genus *Blechnum* to be determined. The overall picture is now apparent, although there will doubtless be detailed work required on individual genera. In the Leptosporangiate ferns the uniformity of the Osmundaceae is consistent, whereas the other two primitive groups, the Schizaeaceae and the Gleicheniaceae, are characterised by several chromosome numbers apparently unrelated to one another. In the genera placed by Copeland in the Pteridaceae there is a uniform group composed of *Adiantum, Pteris* and the Gymnogrammoid ferns, and another group with a marked diversity in chromosome complement. Within this last group there is a section of closely related genera *Paesia, Pteridium,* and *Hypolepis* which may be distinct from the others. Copeland's Pteridaceae appears to be an unnatural grouping. In New Zealand as elsewhere the concept of a distinct family the Thelypteridaceae proposed by Holttum (1947) is supported on cytological grounds, with the local species of *Cyclosorus* being distinct from the other genera of Copeland's Aspidiaceae. The Blechnaceae appears to be more diverse cytologically than the other advanced groups with at least two sections in *Blechnum* itself (n = 28 and n = 33—34) and this family may be more ancient than has been thought. As may be expected from their intermediate position the Hymenophyllaceae show a reasonable amount of variation in chromosome number (Manton and Sledge, 1954; Manton, 1954; Mehra, 1957; Brownlie, 1958). These numbers are not however

so isolated from one another as those of the different members of the Gleicheniaceae. The remaining families represented, the Cyatheaceae, the Davalliaceae, the Aspleniaceae and the Polypodiaceae are much more uniform. This broad picture is similar to that found in all other areas where sufficient species have been examined.

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